

## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : MIYAMOTO ENGINEERING:KK

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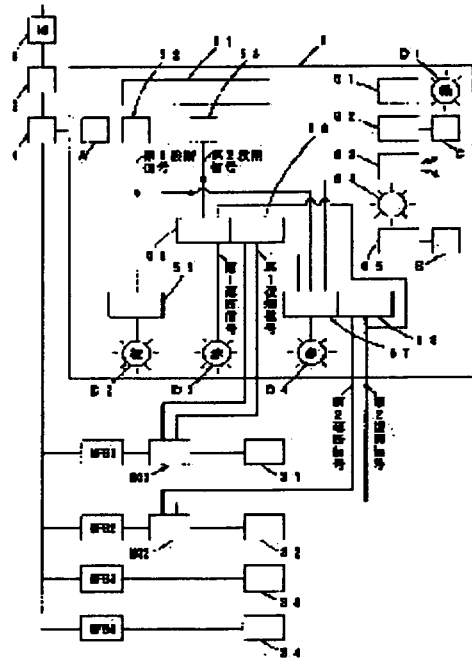
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## (54) POWER CONTROL SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a control system which can be applied to a three-phase three-wire system, can individually set an apparatus to which a power source is cut off, and automatically returns power sources in set order when a load is decreased.

SOLUTION: This power control system is provided with a power monitoring means 4 for monitoring load power, a cut-off priority setting means 51 which sets the order of cutting off a power source individually when a state of overload is generated, a return priority setting means 51 which sets the order of returning the power source when recovering is performed from the state of overload, and a control means 5 which cuts off power sources in an order of sequence, when a state of overload is generated and returns power sources of power apparatuses in the order set, when recovering is performed from an overloaded state.



## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] In the power control system in the power distribution facility equipped with two or more power devices to which electricity is supplied from common power receiving facilities A power monitor means to supervise load power, and a cutoff priority setting means to set up the sequence which intercepts a power source when it changes into an overload condition according to an individual for said two or more power devices of every, A return priority setting means to set up the sequence to which a power source is returned when an overload condition is recovered according to an individual for said two or more power devices of every, When the load power by said power monitor means changes into an overload condition exceeding the power set up beforehand The power control system characterized by having the control means which returns the power source of a power device to the sequence set up in said return priority setting means when the power source of a power device is intercepted in the sequence set up in said cutoff priority setting means and an overload condition is recovered.

[Claim 2] A power monitor means is a power control system according to claim 1 characterized by having CT which detects the current of R phase wiring of three-phase-circuit 3 line type wiring.

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention supervises the power of the power distribution system to which electricity is supplied by two or more power devices from common power receiving facilities, and relates to the power control system which performs optimal employment.

[0002]

[Description of the Prior Art] In the power distribution system by a three-phase-circuit 3 line type power distribution system etc., power distribution use is carried out from common power receiving facilities at power devices, such as two or more motors. For example, a 2kW power device is ten sets and 5kW. The sum total of installation power is set to 45kW in the place of business in which the power device is installed five sets. Therefore, minimum charge will also become a large sum if a contract of power receiving is made on the basis of installation power. However, by 45kW, when only which one set usually works 5 Taizhoug, since there are too more 5kW power devices, it can be said that about 25kW is enough. Then, the breaker of capacity is installed by 25kW and it becomes possible to save minimum charge by the 25kW thing a contract of is made.

[0003] However, if it contracts by last-minute 25kW and two or more 5kW power devices will be worked for the peak of a temporary activity, the problem that a breaker operates, or exceed contract demand and a charge for extra hours is imposed will arise. Then, a contract of contract demand is made with the power fewest possible than installation power, when it becomes that contract demand is likely to be exceeded, it emits an alarm etc., cautions are urged to it, and the managerial system constituted so that actuation of a breaker and generating of a charge for extra hours might be prevented is proposed. Moreover, by home use, in order to prevent sudden interruption of service of a personal computer in use, before a breaker operates, a lamp circuit is intercepted compulsorily and the system constituted so that disappearance of the data of a personal computer might be prevented is also proposed.

[0004]

[Problem(s) to be Solved by the Invention] However, in the system which emits the conventional alarm which was mentioned above, there are whether it being desirable stopping which device's, whenever an alarm is emitted, and a problem of wavering. Moreover, in the latter, since it was fixed to the lamp circuit in single phase 3 line type 100V for home use, it was not able to be used for the place of business which is receiving transmitted electricity by the three-phase-circuit 3 line type. Moreover, since it was fixed to the lamp circuit, the object which intercepts a power source had the inconvenient problem of becoming pitch-black suddenly.

[0005] Then, this invention is a system applicable also to a three-phase-circuit 3 line type, and if a setup is possible and a load falls the device of the object which intercepts a power source according to an individual, it will be made for the purpose of offer of the managerial system which can return a power source to the set-up sequence automatically.

[0006]

[Means for Solving the Problem] The power control system of claim 1 concerning this invention In the power control system in the power distribution facility equipped with two or more power devices to which electricity is supplied from common power receiving facilities A power monitor means to supervise load power, and a cutoff priority setting means to set up the sequence which intercepts a power source when it changes into an overload condition according to an individual for said two or more power devices of every, A return priority setting means to set up the sequence to which a power source is returned when an overload condition is recovered according to an individual for said two or more power devices of every, When the load power by said power monitor means changes into an overload condition exceeding the power set up beforehand When the power source of a power device was intercepted in the sequence set up in said cutoff priority setting means and an overload condition was recovered, a means to have the control means which returns the power source of a power device to the sequence set up in said return priority setting means was provided.

[0007] The power control system of claim 2 was considered as the configuration equipped with CT which detects the current of R phase wiring of three-phase-circuit 3 line type wiring for said power monitor means.

[0008]

[Embodiment of the Invention] Below, the power control system concerning this invention is explained at a detail based on the drawing in which the gestalt of the operation was shown.

[0009] Drawing 1 is the basic plugging chart of the power control system of this invention used for the type of distribution system of a three-phase-circuit 3 line type. In drawing 1, 1 is power dealings meter and 2 is the Maine breaker, and the power device of No. 2 and the power device by which in 31, as for the power device of No. 1, and 32, cutoff priority is served as to 33, and, as for 34, cutoff priority does not serve as a candidate for cutoff. 4 is CT (current transformer) as a power monitor means, and is installed in wiring of R phase of three-phase-circuit 3 line.

[0010] 5 is a peak shaving controller and is equipped with the following configurations.

[0011] Namely, a setting means 51 by which, as for the peak shaving controller 5, from the 1st set point to the 8th set point was set up, A 1st output means 52 to output the 1st step signal until it recovers the time of exceeding the 1st set point, A 2nd output means 53 to output the 2nd step signal until it recovers the time of exceeding the 2nd set point, The 1st step display-control circuit 55 made to switch off after making it blink between the 4th set point which begins an orange indicating lamp D2 based on said 1st step signal, and making it blink between the 4th set point, since continuation lighting is carried out after that and the 1st step signal is no longer outputted, Based on said 2nd step signal, between an antihunting fixed timer (5 seconds) and the 5th set point, make it blink and continuation lighting of the 1st red indicating lamp D3 is carried out after that. The 1st cutoff display-control circuit 56 made to switch off after making it blink between the 6th set point, if the 1st step signal is no longer outputted and the 2nd control circuit 59 is not contained, The 1st control circuit 58 which outputs the 1st return signal in between the 6th set point if the 1st cutoff signal is outputted in between an antihunting fixed timer (5 seconds) and the 5th set point based on said 2nd step signal, said 1st step signal is no longer

outputted and the 2nd control circuit 59 is not contained, The 2nd cutoff display circuit 57 which makes the light put out after making it blink between the 8th set point, since the 1st cutoff signal is outputted, it is made to blink between the 7th set point, continuation lighting is carried out after that and the 1st step signal is no longer outputted, Since the 1st cutoff signal is outputted, the 2nd cutoff signal is outputted in between the 7th installation values and said 1st step signal is no longer outputted, it has the 2nd control circuit 59 which outputs the 2nd return signal in between the 8th set point.

[0012] The load display-control circuit 61 made to switch off in between the 3rd set point when it is made to blink between the 3rd set point, continuation lighting is carried out after that and it becomes under 1A about a green indicating lamp D1 in addition to the above basic circuit, after the load current exceeds 1A. The peak shaving flashing circuit 62 which blinks the peak shaving drop C based on said 2nd step signal, The message pronunciation circuit 63 which utters voice from the time of having exceeded the 2nd set point, continuing 5 seconds or more and exceeding, saying "The electrical and electric equipment uses too much, and it is current set point over", It has the red revolving light 64 which operates based on said 2nd step signal, and the rated display-control circuit 65 which carries out flashing termination of the green rated current drop B since a wink start will be carried out and it will no longer be outputted, if said 1st step signal is outputted.

[0013] Drawing 2 is the front view of the control panel of said peak shaving controller 5. In drawing 2, the indicator A of the red of triple figures can display the present load current value detected by said CT4, and can change it to an electrical-potential-difference display by button grabbing. Flashing control will be carried out by said rated display-control circuit 65, if the green drop B of triple figures displays the 1st set point (rated current value) set up in said setting means 51 and the 1st set point is exceeded. The drop C of the red of 4 figures is a peak shaving drop, and usually displays the 2nd set point as 100%. Flashing control will be carried out by said peak shaving flashing circuit 62 if the 2nd set point is exceeded.

[0014] A green indicating lamp D1 is green LED by which lighting control is carried out in the load display-control circuit 61. An orange indicating lamp D2 is orange LED by which lighting control is carried out in the 1st step display-control circuit 55. The 1st red indicating lamp D3 is LED of the red by which lighting control is carried out in the 1st cutoff display-control circuit 56. The 2nd red indicating lamp D4 is LED of the red by which lighting control is carried out in the 2nd cutoff display-control circuit 57. In addition, a check and voice alarm of the red LED for short circuit alarms, and voice "it is short-circuited. It has the volume I which adjusts the sound volume of the volume H which sets up the button switch G which changes the contents and the setting item of a button switch F and a peak shaving indicator which are changed to the button switch E which suspends check immediately", and an electrical-potential-difference display one by one, the 1st set point - the 8th set point, and voice.

[0015] A sequential setup of each following item can be carried out by pushing said button switch G 0.5 seconds or more. Said red drop A displays "1" in the beginning, and it is shown that he is setting Mohd of the 1st set point (rated current value). At this time, it is set as the current value of 1A-600A by operating said volume H. If a setup is ended, when said button switch G will be pushed, said red drop A displays "2" and it is shown that he is setting Mohd of the 2nd set point. By operating said volume H similarly here, it sets up to 100% - 150%. A sequential setup of the 3rd set point mentioned above - the 8th set point (each timer) is carried out like the following.

[0016] In the power control system of the above configuration, cutoff and the return condition of a load current value change since the place of business concerned begins to work, until it stops working, the condition of each signal, the condition of each annunciator, and a power device are explained based on drawing 3. In addition, 20A and the 2nd set point explain and, as for the 3rd set point, the 1st set point explains the case where the 7th set point was set up and the 8th set point is set [ the 4th set point / the 5th set point ] as 15 seconds for the 6th set point for 10 seconds for 15 seconds for 10 seconds for 10 seconds for 10 seconds, as an example 120% (24A).

[0017] In time of day T0, if the load current detected by said CT4 exceeds 1A, while [ 10 seconds ] a green indicating lamp D1 begins by the load display-control circuit 61 (the 3rd set point), it will blink and continuation lighting will be carried out after that. Then, since the 1st step signal will be outputted from the 1st output means 52 if the load current increases, 5A is exceeded and 1st set point 20A is exceeded in time of day T1, it blinks, while [ 10 seconds ] beginning an orange indicating lamp D2 by the 1st step display-control circuit 55 based on this (the 4th set point), and continuation lighting is carried out after that. Flashing control of the green drop B is carried out by the rated display-control circuit 65 at coincidence. And in time of day T2, if the 2nd set point (120%) is exceeded, the 2nd step signal begins to be outputted, and after carrying out flashing for 10 seconds (the 5th set point) while [ 5 seconds ] the 1st red indicating lamp D3 was set up by the 1st cutoff display-control circuit 56 by the antihunting timer, continuation lighting initiation will be carried out. Flashing control initiation of the peak shaving drop C is carried out by the peak shaving flashing circuit 62 at coincidence.

[0018] And the 1st cutoff signal is outputted to time-of-day T3 after carrying out progress for 10 seconds (the 5th set point) while [ 5 seconds ] being set up by the antihunting timer from time of day T2 from the 1st control circuit 58. The magnet MG 1 of the power device 31 is controlled by this 1st cutoff signal, and the power to the power device 31 is intercepted by it. In order that priority may show that the power of the device of No. 1 is intercepted to coincidence, continuation lighting of the 1st red indicating lamp D3 is carried out. And even if the power to the power device 31 is intercepted, in order to show that priority started cutoff preparation of the power device of No. 2 as it is still the condition that the load current exceeded the 2nd set point, in time-of-day T3, the 2nd red indicating lamp D4 begins to blink by the 2nd cutoff display-control circuit 57. After passing over while [ 5 seconds ] being set as coincidence by the message pronunciation circuit 63 by the antihunting timer, while voice is uttered saying "The electrical and electric equipment uses too much, and it is current set point over", with the 1st cutoff signal, the red revolving light 64 lights up and it begins to rotate.

[0019] And in time-of-day T four of 10 seconds (the 7th set point) after, the 2nd cutoff signal is outputted from the 2nd control circuit 59, the magnet MG 2 of the power device 32 is controlled, and the power to the power device 32 is also intercepted. In order that priority may show that the power of the device of No. 2 is also intercepted to coincidence, continuation lighting also of the 2nd red indicating lamp D4 is carried out.

[0020] Then, if time of day T5 comes and the load current is less than the 2nd set point, the 2nd step signal will no longer be outputted and the peak shaving drop C will change from flashing control to continuation lighting control. Furthermore, if the load current falls and it is less than the 1st set point in time of day T6 In order to show the 1st step signal and the 2nd step signal no longer having been outputted, and having started return preparation of the power device 32, the 2nd red indicating lamp D4 carries out a wink start. The time of day T7 15 seconds (the 8th set point) after comes, the 2nd return signal is outputted, the magnet of the power device 32 is closed, the power of the power device 32 returns, and operation is resumed. If the 1st red indicating lamp D3 carries out a wink start to coincidence and also becomes the time of day T8 15 seconds (the 6th set point) after to it in order to show that the power device 31 also started return preparation, the 1st return signal will be outputted, the magnet of the power device 31 will also be closed, the power of the power device 31 will also return, and operation will be resumed.

[0021] in addition -- the case where a short circuit is detected -- the short circuit annunciator D5 -- blinking -- " -- it is short-circuited. Please check immediately. Alarm tone voice [ as opposed to a short circuit as " ] is generated. Priority is given to the direction of the

alarm tone voice to a short circuit when the condition of having exceeded the 2nd set point, and a short circuit lap.

[0022] Moreover, in the gestalt of the above operation, although the object which controls cutoff/return of power was explained by the case where it limits to two power devices 31 and 32, naturally it is easy to control other power devices 33 and 34. What is necessary is just to carry out connection wiring of said 1st and 2 cutoff signal and 1st and 2 return signal to the magnet of a power device to control. Moreover, even if it outputs the 2nd cutoff signal, when not less than the 2nd set point, it is also possible like outputting the 3rd cutoff signal after 10 seconds, and priority intercepting the power device of No. 3 further, and intercepting the power device of the following priority after 10 seconds further to control cutoff/return of three or more sets of power devices.

[0023] For example, an electricity bill is calculated by the three-phase-circuit 3 line type in tubing of the Kansai Electric Power Co., Inc. according to a formula called electricity bill (circle) = contract demand (kW) x unit price (980 circle) x (100-power-factor +85) / 100. If it follows and the place of business which was 47kW contract demand conventionally makes the trial calculation of the difference at the time of making a contract change to 16kW (50A) (all power-factors are made into 90%).,

In the case of 47kW, it is  $47(\text{kW}) \times 980 \times (\text{circle}) (100-90+85)/100 = 43,757 (\text{circle})$ .

Although it becomes, in the case of 16kW, it is  $16(\text{kW}) \times 980 \times (\text{circle}) (100-90+85)/100 = 14,896 (\text{circle})$ .

Since it becomes, the difference turns into the amount of money of 28,861 yen in one month. Thus, since the optimal automatic overload control becomes possible by managing power with the power control system of this invention, it becomes possible like the above-mentioned example to reduce the electricity bill of the amount equivalent every month.

[0024]

[Effect of the Invention] Since the auto return of the power source to the power device currently intercepted is carried out to sequence according to the priority set up beforehand when according to this invention it changes into an overload condition, and the power device under operation is intercepted in order according to the priority set up beforehand and it returns to an all seems well from an overload condition, it becomes possible to control automatically to hold down load power to below predetermined setting power. Therefore, since a contract of a contract with an electric power company can be made as fewer power loads, an electricity bill is reducible. Furthermore, while being able to set up the power device of a controlled system freely, the set point and the fine control of electric power which was flexibly equivalent to the seasonal variation etc. while operability was excellent, since the set point of a timer until it operates was changed easily of an overload become possible.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the basic plugging chart of the gestalt of operation of the power control system concerning this invention.

[Drawing 2] It is the front view of the control panel of a peak shaving controller.

[Drawing 3] It is a timing-chart Fig. explaining the operating state of each part.

[Description of Notations]

31 For Cutoff Priority, at No. 1, Return Priority is Power Device of No. 2.

32 For Cutoff Priority, at No. 2, Return Priority is Power Device of No. 1.

33 34 Power device besides the controlled system of cutoff/return

4 CT, Power Monitor Means

5 Peak Shaving Controller, Control Means

51 Setting Means, Cutoff Priority Setting Means

51 Setting Means, Return Priority Setting Means

52 1st Output Means

53 2nd Output Means

58 1st Control Circuit

59 2nd Control Circuit

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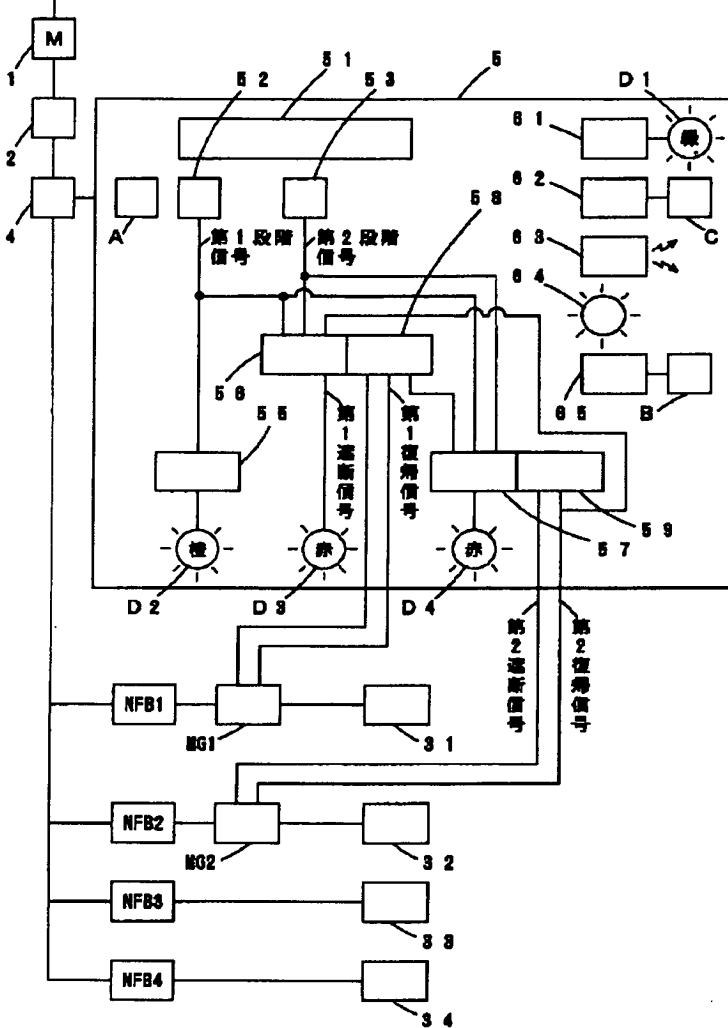
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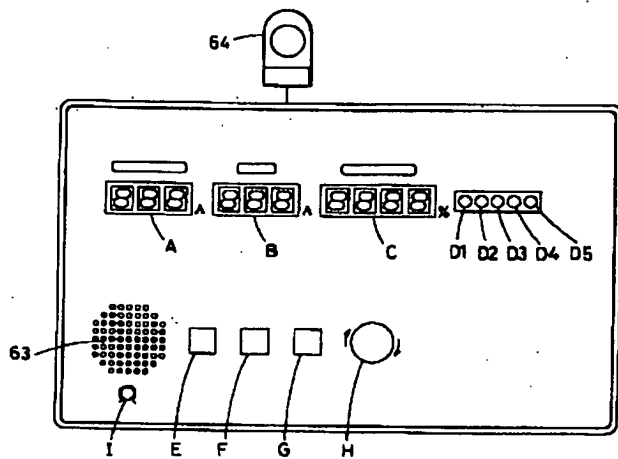
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## DRAWINGS

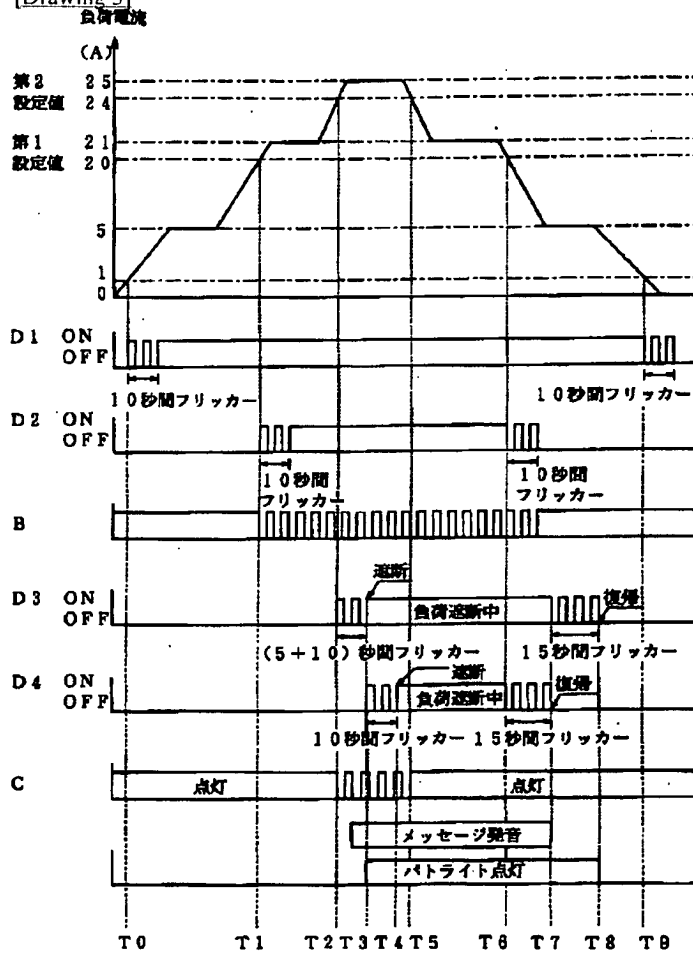
[Drawing 1]



[Drawing 2]



[Drawing 3]



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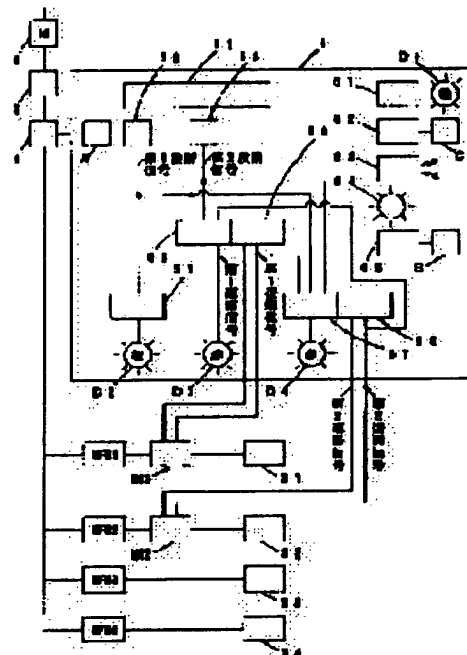
(72)Inventor : MIYAMOTO JUNSUKE

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### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a control system which can be applied to a three-phase three-wire system, can individually set an apparatus to which a power source is cut off, and automatically returns power sources in set order when a load is decreased.

**SOLUTION:** This power control system is provided with a power monitoring means 4 for monitoring load power, a cut-off priority setting means 51 which sets the order of cutting off a power source individually when a state of overload is generated, a return priority setting means 51 which sets the order of returning the power source when recovering is performed from the state of overload, and a control means 5 which cuts off power sources in an order of sequence, when a state of overload is generated and returns power sources of power apparatuses in the order set, when recovering is performed from an overloaded state.



## LEGAL STATUS

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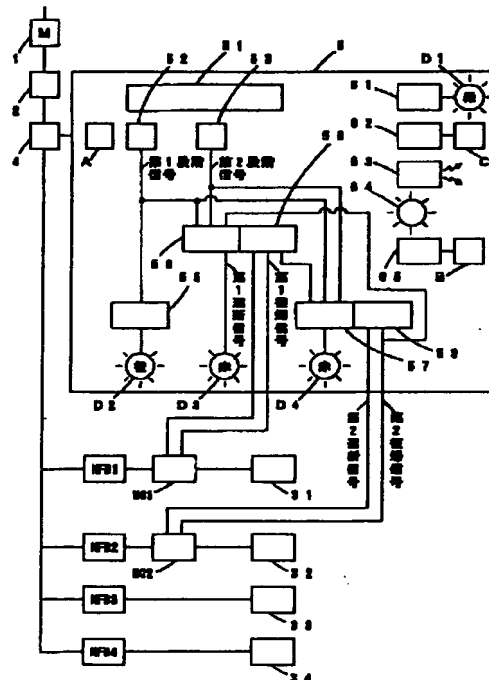
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(54)【発明の名称】 電力管理システム

(57)【要約】

【課題】 3相3線式にも適用可能で、電源を遮断する対象の機器を個別に設定可能であって、負荷が低下すると設定された順番に自動的に電源を復帰させることのできる管理システムの提供。

【解決手段】 負荷電力を監視する電力監視手段4と、過負荷状態になったときに電源を遮断する順番を個別に設定する遮断優先順位設定手段51と、過負荷状態から回復したときに電源を復帰させる順番を設定する復帰優先順位設定手段51と、過負荷状態になったときには設定された順番に電源を遮断し、過負荷状態から回復したときには設定された順番に電力機器の電源を復帰させる制御手段5とを備えた。



## 【特許請求の範囲】

【請求項1】共通の受電設備から配電される複数の電力機器を備えた配電設備における電力管理システムにおいて、

負荷電力を監視する電力監視手段と、  
過負荷状態になったときに電源を遮断する順番を、前記複数の電力機器ごとに個別に設定する遮断優先順位設定手段と、

過負荷状態から回復したときに電源を復帰させる順番を、前記複数の電力機器ごとに個別に設定する復帰優先順位設定手段と、

前記電力監視手段による負荷電力が予め設定された電力を越えて過負荷状態になったときには、前記遮断優先順位設定手段において設定された順番に電力機器の電源を遮断し、過負荷状態から回復したときに、前記復帰優先順位設定手段において設定された順番に電力機器の電源を復帰させる制御手段と、

を備えたことを特徴とする電力管理システム。

【請求項2】電力監視手段は、3相3線式配線のR相配線の電流を検出するCTを備えていることを特徴とする請求項1に記載の電力管理システム。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、共通の受電設備から複数の電力機器に配電されている配電システムの電力を監視し、最適な運用を行う電力管理システムに関するものである。

## 【0002】

【従来の技術】3相3線式配電系統等による配電システムにおいては、共通の受電設備から複数のモーター等の電力機器に配電使用されている。例えば、2KWの電力機器が10台と、5KWの電力機器が5台設置してある事業所においては、設置電力の合計は45KWとなる。従って、設置電力を基準にして受電の契約をすると、基本料金も高額になる。しかし、5KWの電力機器のほうは、普通は5台中何れかの1台しか稼働しない場合、45KWでは多過ぎるので25KW程度で十分といえる。そこで、25KW相当容量のブレーカを設置して、25KWの契約することで基本料金を節約することが可能となる。

【0003】しかし、ぎりぎりの25KWで契約すると、一時的な作業のピークのために5KWの電力機器を2台以上稼働させると、ブレーカが作動してしまったり、契約電力を超過して超過料金が課せられるという問題が生じる。そこで、契約電力は設置電力よりできるだけ少ない電力で契約し、契約電力を越えそうになった場合に警報等を発して注意を促し、ブレーカの作動や超過料金の発生を防ぐように構成された管理システムが提案されている。また、家庭用で、使用中のパソコンの不意の停電を防ぐために、ブレーカの作動する前に、電灯回路を強制的に遮断して、パソコンのデータの消滅を防ぐように構

成されたシステムも提案されている。

## 【0004】

【発明が解決しようとする課題】ところが、上述したような従来の警報を発するだけのシステムでは、警報が発せられる度に、どの機器を止めるのが好ましいか迷うという問題がある。また、後者では、家庭用の单相3線式100Vにおける電灯回路に固定されているので、3相3線式で受電している事業所には使用できなかった。また、電源を遮断する対象は電灯回路に固定されているので、急に真っ暗になったりするという不便な問題があった。

【0005】そこで、本発明は、3相3線式にも適用可能なシステムであって、且つ、電源を遮断する対象の機器を個別に設定可能であって、負荷が低下すると、設定された順番に自動的に電源を復帰させることのできる管理システムの提供を目的としてなされたものである。

## 【0006】

【課題を解決するための手段】本発明にかかる請求項1の電力管理システムは、共通の受電設備から配電される複数の電力機器を備えた配電設備における電力管理システムにおいて、負荷電力を監視する電力監視手段と、過負荷状態になったときに電源を遮断する順番を、前記複数の電力機器ごとに個別に設定する遮断優先順位設定手段と、過負荷状態から回復したときに電源を復帰させる順番を、前記複数の電力機器ごとに個別に設定する復帰優先順位設定手段と、前記電力監視手段による負荷電力が予め設定された電力を越えて過負荷状態になったときには、前記遮断優先順位設定手段において設定された順番に電力機器の電源を遮断し、過負荷状態から回復したときには、前記復帰優先順位設定手段において設定された順番に電力機器の電源を復帰させる制御手段と、を備えるという手段を講じた。

【0007】請求項2の電力管理システムは、前記電力監視手段を、3相3線式配線のR相配線の電流を検出するCTを備えている構成とした。

## 【0008】

【発明の実施の形態】以下に、本発明にかかる電力管理システムを、その実施の形態を示した図面に基づいて詳細に説明する。

【0009】図1は、3相3線式の配電方式に用いた本発明の電力管理システムの基本配線図である。図1において、1は電力取引メーター、2はメインブレーカ、31は遮断優先順位が1番の電力機器、32は遮断優先順位が2番の電力機器、33、34は遮断対象となっていない電力機器である。4は電力監視手段としてのCT（変流器）であり、3相3線のR相の配線に設置されている。

【0010】5はピークカットコントローラであり、以下の構成を備えている。

【0011】即ち、ピークカットコントローラ5は、第

1 設定値から第8設定値までが設定された設定手段51と、第1設定値を越えたときから回復するまで第1段階信号を出力する第1出力手段52と、第2設定値を越えたときから回復するまで第2段階信号を出力する第2出力手段53と、前記第1段階信号に基づいて橙色表示灯D2を始めた第4設定値間は点滅させてその後連続点灯させ、第1段階信号が出力されなくなってから第4設定値間は点滅させた後に消灯させる第1段階表示制御回路55と、前記第2段階信号に基づいて第1赤色表示灯D3をハンチング防止固定タイマー(5秒)と第5設定値間は点滅させてその後連続点灯させ、第1段階信号が出力されなくなると第2制御回路59が入ってなければ第6設定値間点滅させた後に消灯させる第1遮断表示制御回路56と、前記第2段階信号に基づいてハンチング防止固定タイマー(5秒)と第5設定値間後に第1遮断信号を出力し前記第1段階信号が出力されなくなると第2制御回路59が入ってなければ第6設定値間後に第1復帰信号を出力する第1制御回路58と、第1遮断信号が出力され第7設定値間は点滅させてその後連続点灯させ第1段階信号が出力されなくなると第8設定値間点滅させた後に消灯させる第2遮断表示回路57と、第1遮断信号が出力され第7設定値間後に第2遮断信号を出力し、前記第1段階信号が出力されなくなると第8設定値間後に第2復帰信号を出力する第2制御回路59とを備えている。

【0012】以上の基本回路以外に、緑色表示灯D1を、負荷電流が1Aを越えてから第3設定値間は点滅させ、その後は連続点灯させ、1A未満になったときに第3設定値間後に消灯させる負荷表示制御回路61と、前記第2段階信号に基づいてピークカット表示器Cを点滅させるピークカット点滅回路62と、第2設定値を越え5秒以上継続して越えたときから「電気の使い過ぎ 電流設定値オーバーです」と音声を発するメッセージ発音回路63と、前記第2段階信号に基づいて動作する赤色回転灯64と、緑色の定格電流表示器Bを、前記第1段階信号が出力されると点滅開始し出力されなくなると点滅終了させる定格表示制御回路65と、を備えている。

【0013】図2は、前記ピークカットコントローラ5の操作パネルの正面図である。図2において、3桁の赤色の表示器Aは、前記CT4によって検出した現在の負荷電流値を表示するものであり、ボタン操作によって電圧表示に切り替えることができる。3桁の緑色の表示器Bは、前記設定手段51において設定された第1設定値(定格電流値)を表示するものであり、第1設定値を越えると前記定格表示制御回路65によって点滅制御される。4桁の赤色の表示器Cは、ピークカット表示器であり、通常は第2設定値を100%として表示する。第2設定値を越えると前記ピークカット点滅回路62によって点滅制御される。

【0014】緑色表示灯D1は、負荷表示制御回路61によって点灯制御される緑色のLEDである。橙色表示灯D2は、第1段階表示制御回路55によって点灯制御される橙色のLEDである。第1赤色表示灯D3は、第1遮断表示制御回路56によって点灯制御される赤色のLEDである。第2赤色表示灯D4は、第2遮断表示制御回路57によって点灯制御される赤色のLEDである。その他、漏電警報用の赤色LED、音声の確認および音声アラーム「漏電しています。ただちに点検して下さい」の停止を行うボタンスイッチE、電圧表示に切り替えるボタンスイッチF、ピークカット表示器の内容及び設定項目を順次切り替えるボタンスイッチG、第1設定値～第8設定値を設定するボリュームH、音声の音量を調節するボリュームIを備えている。

【0015】前記ボタンスイッチGを0.5秒以上押すことによって以下の各項目を順次設定できる。始めは、前記赤色表示器Aが「1」を表示し、第1設定値(定格電流値)の設定モードであることを示す。このとき、前記ボリュームHを操作することによって、1A～600Aの電流値に設定する。設定を終了したら前記ボタンスイッチGを押すと、前記赤色表示器Aが「2」を表示し、第2設定値の設定モードであることを示す。ここでも同様に前記ボリュームHを操作することによって、100%～150%に設定する。以下同様に、前述した第3設定値～第8設定値(各タイマー)を順次設定する。

【0016】以上の構成の電力管理システムにおいて、当該事業所が稼働し始めてから終業するまでの負荷電流値の変化と各信号の状態及び各表示灯の状態及び電力機器の遮断及び復帰状態を、図3に基づいて説明する。なお、第1設定値は20A、第2設定値は120%(24A)、第3設定値は10秒、第4設定値は10秒、第5設定値は10秒、第6設定値は15秒、第7設定値は10秒、第8設定値は15秒に設定された場合を例として説明する。

【0017】時刻T0において、前記CT4にて検出される負荷電流が1Aを越えると、負荷表示制御回路61によって緑色表示灯D1が始めの10秒間(第3設定値)は点滅してその後は連続点灯される。その後、負荷電流が増加して5Aを越え、時刻T1において、第1設定値20Aを越えると第1出力手段52から第1段階信号が出力されるので、これに基づいて第1段階表示制御回路55によって橙色表示灯D2は始めの10秒間(第4設定値)は点滅され、その後は連続点灯される。同時に、定格表示制御回路65によって緑色の表示器Bは点滅制御される。そして、時刻T2において、第2設定値(120%)を越えると、第2段階信号が出力されはじめ、第1遮断表示制御回路56によって第1赤色表示灯D3がハンチング防止タイマーにて設定された5秒間と10秒間(第5設定値)点滅した後連続点灯開始される。同時に、ピークカット点滅回路62によってピー

クカット表示器Cが点滅制御開始される。

【0018】そして、時刻T2からハンチング防止タイマーにて設定された5秒間と10秒（第5設定値）経過した後の時刻T3に、第1制御回路58から第1遮断信号が出力される。この第1遮断信号によって電力機器31のマグネットMG1が制御されて電力機器31への電力が遮断される。同時に、優先順位が1番の機器の電力が遮断されていることを示すために、第1赤色表示灯D3は連続点灯される。そして、電力機器31への電力が遮断されても負荷電流が第2設定値を越えた状態のままであると、優先順位が2番の電力機器の遮断準備に入ったことを示すために、時刻T3において、第2遮断表示制御回路57によって第2赤色表示灯D4が点滅し始める。同時に、メッセージ発音回路63によって、ハンチング防止タイマーにて設定された5秒間を過ぎてから「電気の使い過ぎ 電流設定値オーバーです」と音声が発せられるとともに、第1遮断信号によって赤色回転灯64が点灯して回転し始める。

【0019】そして、10秒（第7設定値）後の時刻T4においては、第2制御回路59から第2遮断信号が出力され、電力機器32のマグネットMG2が制御されて電力機器32への電力も遮断される。同時に、優先順位が2番の機器の電力も遮断されていることを示すために、第2赤色表示灯D4も連続点灯される。

【0020】その後、時刻T5になって、負荷電流が第2設定値を下回ると、第2段階信号が出力されなくなり、ピークカット表示器Cが点滅制御から連続点灯制御へ変わる。さらに、負荷電流が低下して、時刻T6において、第1設定値を下回ると、第1段階信号と第2段階信号が出力されなくなり、電力機器32の復帰準備に入ったことを示すために第2赤色表示灯D4が点滅開始し、15秒（第8設定値）後の時刻T7になって第2復帰信号が出力されて電力機器32のマグネットが閉じられて電力機器32の電力が復帰して運転が再開される。同時に、電力機器31も復帰準備に入ったことを示すために第1赤色表示灯D3が点滅開始し、更に15秒（第6設定値）後の時刻T8になると、第1復帰信号が出力されて電力機器31のマグネットも閉じられて電力機器31の電力も復帰して運転が再開される。

【0021】なお、漏電が検出された場合には、漏電表示灯D5が点滅し、「漏電しています。ただちに点検して下さい。」と漏電に対する警報音声を発生する。第2設定値を越えた状態と漏電とが重なった場合には、漏電に対する警報音声の方が優先される。

【0022】また、以上の実施の形態においては、電力の遮断／復帰の制御を行う対象は、二つの電力機器31、32に限定した場合で説明したが、他の電力機器33、34を制御することも当然容易である。制御したい電力機器のマグネットへ、前記第1、2遮断信号と第1、2復帰信号とを接続配線すればよいのである。ま

た、第2遮断信号を出力しても第2設定値を下回らない場合には、更に、10秒後に第3遮断信号を出力して優先順位が3番の電力機器を遮断し、更に、10秒後には次の優先順位の電力機器を遮断する等のように、3台以上の電力機器の遮断／復帰を制御することも可能である。

【0023】例えば、関西電力株式会社の管内における3相3線式に電気料金は、

$$\text{電気料金(円)} = \text{契約電力(KW)} \times \text{単価(980円)} \times (100 - \text{力率} + 85) / 100$$

という式に従って計算される。従って、従来47KWの契約電力であった事業所が、16KW(50A)に契約変更した場合の差を試算してみると、(力率はすべて90%とする。)

47KWの場合、

$$47(\text{KW}) \times 980(\text{円}) \times (100 - 90 + 85) / 100 = 43,757(\text{円})$$

となるが、16KWの場合は、

$$16(\text{KW}) \times 980(\text{円}) \times (100 - 90 + 85) / 100 = 14,896(\text{円})$$

となるので、その差額は1ヶ月で28,861円という金額になる。このように、本発明の電力管理システムで電力を管理することによって、最適な過負荷制御が可能になるので、上記例のように、毎月相当額の電気料金を節減することが可能となるのである。

【0024】

【発明の効果】本発明によれば、過負荷状態になったときに予め設定された優先順位に従って稼働中の電力機器を順番に遮断し、過負荷状態から正常状態に復帰した場合には、予め設定された優先順位に従って、遮断されていた電力機器への電源を順番に自動復帰するので、負荷電力を所定の設定電力以下に抑えるように自動的に制御することが可能になる。従って、電力会社との契約をより少ない電力負荷として契約できるので、電気料金を節減できる。さらに、制御対象の電力機器を自由に設定できるとともに、過負荷の設定値や作動するまでのタイマーの設定値を簡単に変更できるので、操作性が優れているとともに、季節変動等にフレキシブルに対応した細かい電力管理が可能となる。

【図面の簡単な説明】

【図1】本発明にかかる電力管理システムの実施の形態の基本配線図である。

【図2】ピークカットコントローラの操作パネルの正面図である。

【図3】各部の動作状態を説明するタイミングチャート図である。

【符号の説明】

31 遮断優先順位が1番で、復帰優先順位が2番の電力機器

32 遮断優先順位が2番で、復帰優先順位が1番の電

力機器

33, 34 遮断/復帰の制御対象外の電力機器

4 CT, 電力監視手段

5 ピークカットコントローラ, 制御手段

51 設定手段, 遮断優先順位設定手段

\* 51 設定手段, 復帰優先順位設定手段

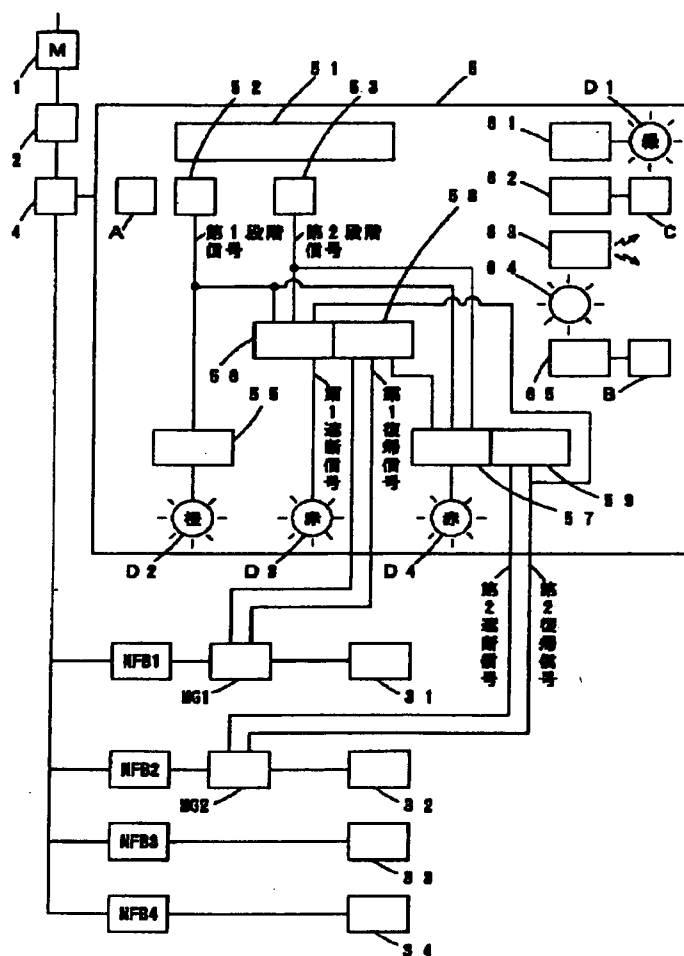
52 第1出力手段

53 第2出力手段

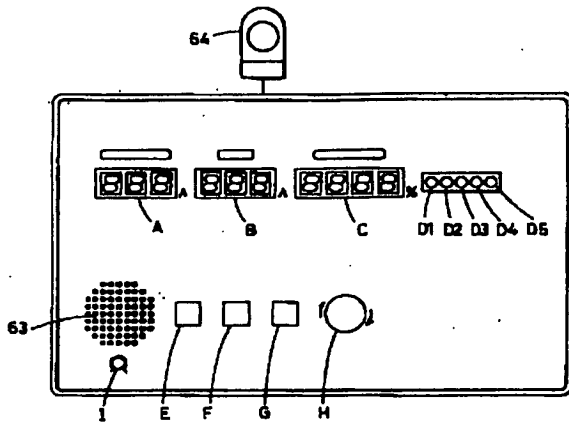
58 第1制御回路

\* 59 第2制御回路

【図1】



【図2】



【図3】

